HARRISON COLLEGE INTERNAL EXAMINATION 2022

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION

SCHOOL BASED ASSESSMENT

PURE MATHEMATICS

UNIT 1 – TEST 2

Time: 1 hour and 20 minutes

NAME OF STUDENT: ____

SCHOOL CODE: 030014_________

DATE: ____________________________________

This examination paper consists of 8 printed pages and 1 blank page.

The paper consists of 4 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write your name clearly in the space above.
2. Answer **ALL** questions in the **SPACES PROVIDED**.
3. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided. You must also write your name and candidate number clearly on any additional paper used.
4. Number your questions **carefully and identically to those on the question paper**.
5. Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures.

EXAMINATION MATERIALS ALLOWED

1. Mathematical formulae
2. Electronic calculator (non-programmable, non-graphical)

1. (a) (i) Show that $(\sec\theta - \tan\theta)^2 \equiv \frac{1-2\sin\theta+\sin^2\theta}{\cos^2\theta}$. [3]

(ii) Hence, show that

$$\frac{1-\sin\theta}{1+\sin\theta} \equiv (\sec\theta - \tan\theta)^2$$

[4]

(b) Find the general solutions of the equation $\sin\theta = 2\cos^2\theta - 1$. [8]

Total 15 marks

2. (a) (i) Determine the center and radius of the circle, C_1, with equation $x^2 + y^2 - 6x - 2y = 16$. [4]

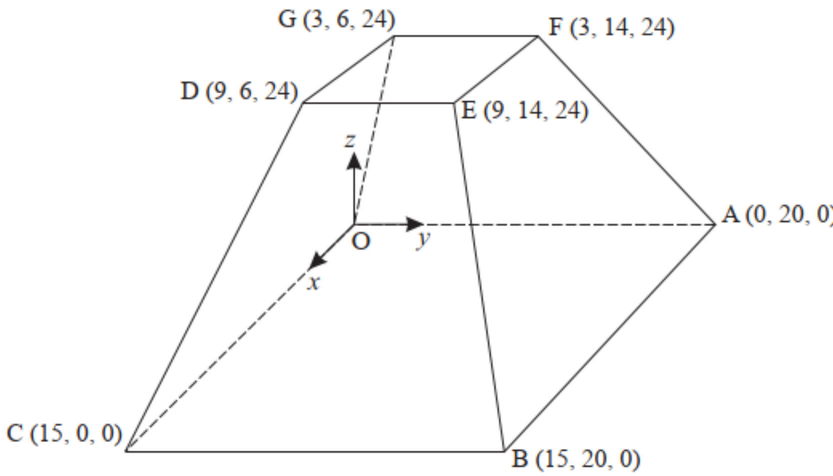
(ii) Another circle, C_2, has center $\left(6, -\frac{7}{2}\right)$ and radius $\frac{\sqrt{65}}{2}$. Write the equation of C_2 in the form $x^2 + y^2 + ax + by = c$. [3]

(iii) Sharon wants to create a logo using the 2 circles. Determine the points of intersection of the 2 circles. [9]

(b) A point $P(x, y)$ moves so that its distance from the fixed point (0, 2) is three times the distance from the fixed point (6, 1). Show that the equation of the locus of the point $P(x, y)$ is a circle. [8]

Total 24 marks

3. A glass ornament $OABCDEFG$ is a truncated pyramid on a rectangular base (see figure below). All dimensions are in centimetres.



(i) Write down the vectors $\overrightarrow{CD}$ and $\overrightarrow{CB}$. [3]

(ii) Find the length of the edge CD. [2]

(iii) Show that the vector $4i + k$ is perpendicular to the vectors $\overrightarrow{CD}$ and $\overrightarrow{CB}$. Hence find the cartesian equation of the plane $BCDE$. [6]

(iv) Write down vector equations for the lines OG and AF.

Show that they meet at the point P with coordinates $(5, 10, 40)$. [6]

Total 17 marks

4. A curve C is given by the parametric equations

$$x = t + 1, \quad y = t^2 - 1, \quad t \in \mathbb{R}$$

Determine the Cartesian equation of C in the form $y = ax^2 + bx + c$. [4]

Total 4 marks

Total 60 Marks

END OF EXAMINATION